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TWO NEW SPECIES OF MARINE OSTRACODA
(PODOCOPA) FROM CALIFORNIA

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While collecting benthic species of ostracods (Podocopa) in the littoral and in the shallow waters along the coast of central California, the writer established that these forms are very strongly represented in this region; the number of species is very large, indeed. In spite of this abundant representation, only a few species of the group have been recorded or described from California. The first paper to deal with this group in California was that of Juday (1907), in which two species from southern California are listed, viz.: *Xestoleberis dispar* Müller and *Paracytheroma pedrensis*, the latter described as a new species under a new genus. Of the former species, only the male and female shells are described and figured. As a consequence, the specific identity of this form is uncertain. The only thing which we can say with full certainty is that it is not identical with Müller's species of this name. With less certainty, it may also be said that the male and female described belong to different species. In regard to *Paracytheroma pedrensis*, see below under the discussion of *Cytheroma*. The second paper on this subject to appear, viz., that of Baker (1912), also dealt with material from the southern part of this state. In it Baker described two marine species under the names of *Xestoleberis transversalis* and *Xestoleberis flavescens*. Unfortunately, these forms were treated in such a defective and incompetent manner that their generic and specific status must be judged either incorrect or uncertain. *Xestoleberis transversalis* probably refers to two species of *Loxoconcha*, although his figure 62:A may represent a species of *Xestoleberis*. Most of the figures of *Xestoleberis flavescens* evidently were

drawn from a species of the genus *Cythereis*; but figures 63:B and D may have been drawn from a species of *Xestoleberis*. The third and last paper dealing with members of the Podocopa in the shallow waters of California is that of Skogsberg (1928), describing five new species of *Cythereis*, viz., *C. aurita*, *C. glauca*, *C. montereyensis*, *C. pacifica*, and *C. platycopa*. One of these species, *C. montereyensis*, may be specifically identical with *Xestoleberis flavescens* Baker, but Baker's (1912, p. 114) statement that the shell is "translucent throughout" seems to contradict this conclusion sufficiently to justify the postponement of this identification pending supplementary investigation of Baker's material. Baker's figures and description of the appendages and of the penis (called "anal armature") evidently are too erroneous to be utilized for specific identification.

As will be seen from this brief review, the information available on this subject is not only scanty but also in part uncertain. This report is, unfortunately, only a minor contribution to help correct the present undesirable situation. However, it is hoped that it will help in a fundamental manner by showing the necessity for detailed descriptions of minute accuracy. It would be fortunate, indeed, if the specific descriptions of this group of the west coast of North America would be done in such an accurate and thorough manner that confusion such as that prevailing in regard to the European marine ostracod forms could be avoided. After many years of intensive work on the ostracods, the writer (Skogsberg, 1920, p. 8) arrived at the conclusion that "as many organs as possible must be subjected to a careful investigation and described correctly, attention being paid to the variety of the details." This necessity evidently is still not clearly seen by a great number of later investigators, but the above statement is unquestionably true.

Cytheroma G. W. Müller

Cytheroma G. W. MÜLLER (1894, p. 349); *Paracytheroma* C. JUDAY (1907, p. 137);
Cytheroma and *Paracytheroma* G. W. MÜLLER (1912, pp. 314-315).

Diagnosis: See the three references given above.

Shell: No distinct sexual dimorphism. Smooth, transparent, very thin, and fragile. With a small clasping tooth at anterior and posterior ends of hinge and a narrow clasping lip between teeth on opposite valve; teeth sometimes so small that they can hardly be clearly distinguished. Inner line descends more or less abruptly just in front of eye; in posterior part of shell, this line is somewhat sigmoid. (This line may be somewhat incorrectly represented by Juday, 1907, pl. 18:3.) Selvage well developed, thin, hyaline, with smooth edge.

First antenna: No distinct sexual dimorphism. Of moderate length, strong, with six segments. When at rest, last four segments form distinct knee with

second segment being bent upwards. Total length of segments 3-5 subequal to length of second segment. Fifth and sixth segments with parallel sides; fifth segment about twice longer than wide, sixth segment from about two to five times longer than wide. Probable number of bristles: second and third segments each one; fourth segment, two; fifth segment, four; and sixth segment, three. All of these bristles either of moderate length or rather short; a varying number of those on segments 3-6 are more or less claw-like; one of the three bristles on end segment is claviform and sensory.

Second antenna: No distinct sexual dimorphism. Strong and of moderate length. Situated on well-developed, segment-like process which is supported by a strong, chitinous exoskeleton. Protopodite about twice as long as high; without bristles. Exopodite 2-segmented; first segment sub-equal in width throughout and about as long as endopodite; second segment decidedly narrower than first and about half as long. Endopodite with three segments, of which the second is about twice longer than first and becomes narrower distally at a fairly uniform rate; length of third segment subequal to distal width of segment. First segment with one postero-distal bristle. Second segment with two closely-set bristles near middle of anterior side. Somewhat distal to these, there is on posterior side of segment a group of three bristles, one of which is claviform and sensory. Postero-distally on this segment, there is situated a moderately long bristle and (always?) a vestigial one. Distal segment with two fairly long and strong claws, one of which is postero-proximal in position.

Mandible: No distinct sexual dimorphism. First segment of protopodite (masticatory) large and strong or of moderate size and strength, wedge-shaped, without rounded hump on anterior side, and with sigmoid posterior side. Toothed edge of pars incisiva with about seven teeth, decreasing fairly regularly the more posteriorly they are situated; the anterior tooth is large, strong, fang-like, the remaining ones are 2- to 3-pointed distally. Between teeth number 1 and 2 there are two narrow bristles about as long as tooth number 1; and between teeth number 2 and 3 there is a similar, although shorter, bristle; finally, there is a fairly short bristle somewhat proximal to most posterior tooth. Somewhat ventral to palp, this segment has on anterior side a single bristle. Palp of moderate strength and about 0.5-0.7 as long as masticatory segment is high; fairly distinctly 4-segmented. Of these four segments, the second segment of protopodite is somewhat larger than either of the first and second segments of endopodite which are subequal; distal segment very small and about as long as wide. Second segment of protopodite with two ventral bristles. Epipodial appendage situated dorso-laterally on second segment of protopodite, its number of bristles varying from two to four. Endopodite: First segment with five distal bristles; one of these is dorsal, two are ventral, and two are medial. Number of bristles of second and third segments is not known except for species described below, but is probably constant, or nearly so. In this species, the following numbers are to be found: Second segment with two

ventro-distal bristles, and dorso-medially to these a single bristle occurs. Dorsal and somewhat distal to middle of segment, there is a transverse row of seven bristles. Third segment with four distal bristles. All the bristles of endopodite either of moderate strength or weak; almost all of them are either naked or furnished with very short and fine hairs; a few of them may have some fairly long, fine hairs.

Maxilla: No distinct sexual dimorphism. Epipodial appendage with 15-17 marginal bristles, the antero-ventral one of which is "aberrant," i.e., directed forward and naked or nearly so, of about the type figured for *Cytheroma variabilis* by G. W. Müller (1894, pl. 26:12). The number may be constantly 17; in other words, Juday's plate 18:7, in which only 15 marginal bristles are drawn, may be erroneous. Protopodite with three endites which increase somewhat in length the more distally they are located, the distal one slightly shorter than the palp. Number of bristles on each endite probably seven to eight. Palp distinctly 2-segmented; distal segment about half as long as, and distinctly narrower than proximal one. Bristles of palp uncertain except in species described below. In this species, first segment has six distal bristles, four of which are dorsal and two ventro-lateral; distal segment with three bristles.

Fifth limb: No distinct sexual dimorphism. Comparatively short and weak; total length of exopodite either subequal to or somewhat less than length of protopodite. Protopodite with four bristles on anterior side, two of which are distal, one at about middle, and one somewhat proximal. On posterior side, there is a single bristle somewhat proximal to middle of segment. Exopodite 3-segmented, with one bristle, besides the end claw, viz.: a ventro-distal one on first segment.

Sixth limb: No distinct sexual dimorphism. Of about ordinary size, thus distinctly larger than fifth. Total length of second and third segments of exopodite somewhat less than length of first segment of exopodite. Differs from description of fifth limb given in last paragraph in having one bristle at knee and posterior bristle of protopodite somewhat more proximal.

Seventh limb: No distinct sexual dimorphism. Decidedly larger than sixth, with total length of second and third segments of exopodite subequal to length of first segment of exopodite. Number of bristles of protopodite apparently variable; in species described below, it is four, i.e., the same as in sixth limb, and at the same locations; in Juday's (1907) species, it is three, one of the anterior above the knee bristle being absent; and in Müller's (1894) species only one is present, viz.: one of those on anterior side proximal to knee. Bristles on anterior side of protopodite, proximal to knee, always reduced; even when two of them are present they are vestigial or nearly so. Exopodite with same bristles as in case of sixth limb.

Fifth to seventh limbs: Protopodites of these limbs have no complicated chitinous skeletons, such as are found, for instance, in the genus *Cythereis*,

where they serve to guide the tendons of the extensor and flexor lodged in the protopodite. A most remarkable feature in regard to these limbs of the species described below is that the second segment of exopodite is furnished with a well developed extensor. This muscle is present in the genera of the family Cypridae, but, evidently, is frequently absent in members of Cytheridae. Compare, for instance, text figure VIII in Skogsberg (1928) and figure 3:30 in Skogsberg (1917). This feature is not known for Juday's and Müller's species, but it is, of course, highly probable that we are concerned with a generic character. *Cytheroma* would thus be very primitive in this particular respect.

Furca: Small and furnished with three bristles in males and two in females.

Posterior extremity of body rather long and conical. Chitinous skeleton of body and appendages rather colorless, without the pronounced yellowish color present in some genera, e.g., in *Cythereis*.

Type species: *Cytheroma variabilis* G. W. Müller, from Naples, Italy.

The genus is probably of wide distribution, having been recorded from the Mediterranean and from the Pacific coast of North America. Undoubtedly benthic in all cases. Juday (1907, p. 138) reported his species to have been taken in plankton. This mode of occurrence, however, if correct, was undoubtedly due to the swirl of heavy surf, a water movement which often causes bottom organisms to be raised temporarily into the upper waters along the California coast.

Remarks: The species described below is undoubtedly very closely related to *Paracytheroma pedrensis* Juday (1907, p. 138). The question as to whether it is specifically identical with this form will not be possible to settle until a detailed re-examination of Juday's material has been undertaken. However, even though several errors unquestionably occur in Juday's pictures of this species, there are some features in these figures which at least strongly suggest that *P. pedrensis* and the form described below are specifically distinct: see, for instance, Juday's plate 18:11, of the postabdomen of the female, and note especially the shape of the genital verruca.

Juday made his species the type of a new genus, but he did not discuss the relationship between this genus and previously established genera. However, by choosing the name *Paracytheroma*, he undoubtedly expressed the opinion that it was most closely related to *Cytheroma*, a genus established by G. W. Müller (1894, p. 349) on a single species, *C. variabilis*.

In his large, synoptic work on the ostracods, G. W. Müller (1912, p. 315) accepted *Paracytheroma* as a valid genus. After having stressed the close relationship between the two genera, Müller noted the following characters, in which *Paracytheroma* would differ from *Cytheroma*. Distal segment of first antenna about five times longer than wide, as compared with a length twice the width in *C. variabilis*. Only one of the three bristles of this segment is claw-like, while in *C. variabilis* two of them are. The epipodial appendage of the

mandible has two long bristles, instead of one long and one short. The protopodite of the seventh limb has only one bristle in *C. variabilis*, while in *Paracytheroma* there are in addition to this one, one bristle at knee and one on posterior side of segment. In regard to the last two characters, *C. variabilis* would thus have suffered losses, and loss variations have, as we know, comparatively small systematic significance. However, even though we accept these characters at their face value, it seems hardly advisable to consider the relatively minute differences which they represent as sufficient ground for generic differentiation. At the most, they may justify the retention of *Paracytheroma* as a subgenus of *Cytheroma*, in order to stress a possible geographic differentiation. If genera within the ostracods were to be founded consistently on characters of this small magnitude, it would be necessary to establish a very large number of new genera, a procedure of very questionable value to science.

A close comparison between *Cytheroma variabilis*, as described by Müller (1894, p. 350) and the species described below will show that although these two species are quite closely related, nevertheless they are mutually somewhat farther removed than are Juday's *Paracytheroma* and my species. A striking indication of relationship between *Cytheroma variabilis* and the new species is found in the line of concrescence of the shell; the latter species exhibits the same peculiar variability in this character as that noted by Müller (1894, pl. 26:5, 10) in the former species. The most conspicuous difference between Müller's species and that of the writer is to be found in the external genitalia of the female (a feature usually very conservative in this family). However, in this connection notice should be taken of the fact that, according to Juday's figure of this organ (1907, pl. 18:11), *Paracytheroma pedrensis* differs very strikingly from both these species, being contrary to the others, very primitive in this respect.

Cytheroma similis Skogsberg, new species

Plates 27 and 28, Figures 1-13

Description: MALE:

Shell: Length, 0.66-0.70 mm. Length: height, 2.2-2.3:1. Right and left valves of about identical size and shape. Seen from side, shell is of about the shape represented in figure 1; in other words, it resembles that of *Paracytheroma pedrensis* (Juday, 1907, pl. 18:3), except that its posterior end is somewhat lower relatively. Seen from above, of about the same type as in *Cytheretta intermedia*, only slightly more pointed at extremities (pl. 27, fig. 1). Pores of surface of shell rather conspicuous and moderate in number, some of them with short, simple hair. Line of concrescence rather complicated and somewhat variable; usually of type represented by appended figure, but may approach condition represented by Müller (1894, pl. 26:10). Most marginal pores furnished with short, simple hair. Inner line usually of type represented by

appended figure, but slight variations occur. Selvage reaches somewhat beyond margin of shell; its edge smooth (oc. 4; oil immersion 1/12). In transmitted light, shell has light brownish-grey color; in reflected light it is milky white.

First antenna (pl. 27, fig. 2): Of about same shape as in *Paracytheroma pedrensis* Juday (1907, pl. 18:5); in other words, distal segment about five times longer than wide. Bristle of second segment is postero-distal, about as long as posterior side of segment, rather weak, slightly annulated, naked or almost so. Bristle of third segment antero-distal, about as long as or slightly longer or shorter than total length of three distal segments, and fairly strong. The two bristles of fourth segment are both medial and distal, and one is anterior, the other is posterior; both are rather strong, the anterior being distinctly the stronger; subequal in length to bristle of third segment. Of the four bristles of fifth segment, three are antero-distal and one postero-distal. Of the three anterior, two are subequal and about as long as total length of two distal segments, the third is somewhat longer; one of the two shorter is strong, the others are weak. Posterior bristle of this segment is weak and somewhat longer than distal segment. The anterior of the three bristles of distal segment is moderately strong and about 1.5 as long as segment; the remaining two are joined at base and of same types and relative lengths as in *Paracytheroma pedrensis*. All bristles of distal four segments naked and non-annulated. Pilosity: First segment with row of short, fine hairs dorso-distally. On anterior side of second segment there are a number of rather long hairs; and distally on this segment there is both on medial and lateral sides a dense row of short, fine hairs.

Second antenna: (pl. 27, fig. 4): Of about the same type as in *C. variabilis* Müller (1894, pl. 26:11). Bristle of first segment of endopodite somewhat shorter than posterior side of second segment, its tip reaching to or somewhat beyond the sensory bristle of second segment; of moderate strength, non-annulated and furnished with short, scarcely visible hairs. The two anterior bristles of second segment of endopodite located at middle of this segment; one of them about twice the length of the other and about as long as segment; both of them are naked. Of the group of three bristles on posterior side of this segment, the sensory, claviform bristle extends to tip of distal segment; the remaining two somewhat longer and either of mutually subequal length or one may be about 0.25 shorter than the other; the lateral of the last two bristles is naked or nearly so, the medial is furnished with fine, short hairs. Of the two postero-distal bristles of this segment, one agrees with the just mentioned lateral bristle except that it is somewhat shorter; the other is vestigial. Of the two large claw-like bristles of distal segment, the proximal is about half as long as endopodite, the distal is somewhat shorter (the tips of these bristles extending about equally far); both bristles naked. Pilosity: Ventro-proximally on protopodite, there are a few moderately long hairs which may be absent. Dorso-distally this segment has a row of short, fine hairs; and such a row is also to be found ventro-distally on lateral side. On anterior side of first segment of endopodite, there

are numerous rather long hairs. Such hairiness is also to be found on proximal half of anterior side of second segment of endopodite; and along greater part of posterior side of this segment there are numerous short transverse rows of short, fine hairs. Along medio-distal edge of this segment, there is a series of fine, short hairs.

Mandible (pl. 27, figs. 3, 5): Toothed edge of pars incisiva with seven teeth. Second and third teeth 3-4-pointed distally; remaining teeth usually 2-pointed; bristle slightly proximal to posterior tooth is about as long as this tooth. Bristle on anterior side of masticatory segment about as long as or somewhat longer than anterior tooth of pars incisiva, sometimes slightly annulated, and furnished with short hairs, or almost naked. Second segment of protopodite usually not very distinctly separated from first segment of endopodite. Of its two ventral bristles, one is nearly distal, the other located somewhat proximally to middle of segment; both about as long as segment, and naked. Epipodial appendage with four bristles; the two posterior ones long, the next about half this length, and the anterior only about one-third the length of its neighbor; all four seem to be furnished with long, fine hairs. Dorso-distal bristle of first segment of endopodite about as long as or somewhat longer than second segment of endopodite and has a moderate number of fairly long hairs. The two ventro-distal bristles of this segment subequal and about as long as, or slightly longer or shorter than, endopodite. Of the two medio-distal bristles, the dorsal one is nearly twice as long as the ventral, and about as long as the ventral side of first and second segments of endopodite, or somewhat shorter; the ventral one of these two bristles furnished with a few long hairs. Second segment of endopodite: Of the two ventro-distal bristles, one is about as long as the longer of the two last-mentioned bristles, the other is about half as long or somewhat shorter. Of the seven dorsal bristles, five are about as long as endopodite, the remaining (dorsal) two are shorter, the smaller of them being only about one-third this length. The remaining bristle of this segment is somewhat stronger than the others, and slightly longer than total length of distal two segments of endopodite. The four bristles of end segment of somewhat different lengths, the longest being of the size of the last-mentioned bristle. Most bristles of palp non-annulated, a few of them with weak annulation; all of them, except those specially noted above, are naked or furnished with exceedingly fine and short hairs. This limb seems to be without pilosity.

Maxilla: Epipodial appendage with 17 bristles; differs from that of *C. variabilis* (Müller 1894, pl. 26:12) mainly in having the aberrant bristle somewhat longer, about as shown by Müller (1894, pl. 26:16). Other parts very similar to type represented for *Loxoconcha mediterranea* by Müller (1894, pl. 26:38). First endite with seven bristles, the ventral one of which is rather long and strong and situated markedly proximally with reference to the others; remaining ones comparatively short and weak. Second endite with seven to eight bristles; third endite with seven bristles. All of these bristles of moderate length

and strength (about as in the noted figure), some of them naked or almost so, the others furnished with more or less long hairs. The four dorso-distal bristles of first segment of palp are about as long as, or somewhat longer than palp, naked or with short or moderately long hairs. Of the two remaining bristles of this segment, one is about twice longer than end segment or somewhat more, naked or almost so; the other (more dorsal one) is so short and weak as to be nearly invisible even with Leitz oil immersion 1/12. The three bristles of distal segment mutually of somewhat different lengths about as long as, or somewhat longer than twice the length of this segment; naked or almost so; one of the more ventrally located of them is rather strong, the others of moderate strength, like the remaining bristles of the palp. Limb seems to have no pilosity.

Fifth limb (pl. 28, fig. 6): Protopodite subequal in length to exopodite. Bristle at about middle of anterior side of protopodite about as long as this side; the somewhat more proximal bristle extends about to tip of segment, both these bristles slightly annulated and almost naked. Of the two bristles at knee, the lateral is rather strong, non-annulated, with short, fine hairs, and usually not quite so long as first segment of exopodite. The medial is short, weak, and its length is subequal to distal width of protopodite. Posterior bristle of this segment about half as long as posterior side of segment, at most with slight traces of annulation, and naked or almost so. Exopodite: Length of first segment subequal to total length of second and third segments; these are about equal in length, or third segment is slightly the shorter. Bristle of first segment distinctly longer than second segment, naked or with very fine and short hairs. End claw slightly shorter than first segment, nearly evenly curved, and almost naked. Pilosity: Protopodite apparently naked. Along ventral side of exopodite numerous transverse rows of very short and fine hairs.

Sixth limb (pl. 28, fig. 8): Protopodite about as long as, or rather slightly longer than first segment of exopodite. Its anterior bristles usually somewhat shorter than corresponding bristles of fifth limb; its posterior bristle somewhat longer relatively; all these bristles non-annulated, and naked or almost so. Exopodite: Second and third segments subequal in length. End claw somewhat more than one-half length of first segment, uniformly curved. Fine pectination at distal ends of first and second segment of exopodite. In other respects this limb agrees with fifth limb.

Seventh limb (pl. 28, fig. 9): Proportions between segments about as in preceding limb. Protopodite with same number of bristles as in sixth limb. The bristle at knee rather strong, its length slightly exceeding distal width of protopodite, naked or nearly so. The remaining two of anterior bristles of protopodite very small, the more distal of them even vestigial, nearly impossible to detect. Bristle on posterior side of this segment somewhat shorter than in preceding limb. Exopodite: Bristle of first segment with very fine, short hairs. End claw with vestigial pectination. Third segment with distal pectination. In other respects as sixth limb.

Chitinous support of the last three limbs, at sides of body, rather constant, and of type represented in plate 28, figure 7.

Brush-shaped organ (pl. 28, fig. 12) : Long and narrow, about eighth times longer than average width; with a fairly large number of terminal bristles, about half as long as stem of organ.

Penis (pl. 28, fig. 13) : right and left organs similar. Copulatory appendage with narrowly rounded tip; free end of vas deferens rather short, curved. Behind the two penes a shield-like plate with fine, rather short marginal hairs.

FEMALE:

Shell: Two of the three females which I examined had the line of concretion of the type figured by Müller (1894, pl. 26:5), only the number of marginal pores was somewhat larger than in this figure.

Genital verruca (pl. 28, fig. 11) : Quite characteristic, subquadrangular; furnished with three processes; two of these situated antero-ventrally and of these the medial one is ovoid, the other lanceolate; the remaining process situated near middle of ventral side, small and pointed. This organ located relatively far behind seventh limb.

Furca (pl. 28, fig. 11) : The two bristles of moderate length, about length of genital verruca, finely annulated, with short hairs.

Posterior end of body rounded mammilliform, with a bunch of moderately long hairs.

Two males and two females were carefully examined.

Type locality: Pacific Grove, Monterey Bay, California: depth, 15 m., sand and rocks; Dec. 15, 1920: 4 males, 3 females.

Xestoleberis G. O. Sars

For diagnosis, see Müller (1894, p. 332).

This genus, which was established in 1865 by G. O. Sars, is one of the largest among the Ostracoda and apparently is represented throughout all the seas of the world. Since a large number of the described species are very incompletely known and since much of the knowledge of the genus is very uncertain, it seems most advisable to postpone the attempt to give to the genus a more elaborate description than the one presented by Müller (1894). Judging by material which I have examined, the number of undescribed species is very great.

Xestoleberis hopkinsi Skogsberg, new species

Plates 29 and 30, Figures 1-16

Description: MALE.

Shell (pl. 29, figs. 1-4) : Length, 0.51-0.54 mm. Length:height, about 1.8:1. Length:width, about 2.1:1. Seen from the side and from above, of about the

shape described and figured for *Nestolcberis granulosa* by G. S. Brady (1880, p. 125, pl. 30:5, a-d). All the specimens examined by the writer agree almost perfectly with the appended figures. Surface with moderate number of distinct pores. In regard to pores along anterior margin, see appended figure; along posterior margin, pores are about as widely spaced as along dorsal portion of anterior margin; along posterior half of ventral margin they are somewhat more numerous, not quite so numerous as along ventral portion of anterior margin, however. On surface of shell, a moderate number of fine rather short hairs occur; and such hairs are fairly numerous along anterior margin and anterior portion of ventral margin. Muscular impressions about as in appended figure. Color whitish in reflected light, light brown in transmitted light, the posterior one-half to one-third being usually somewhat reddish brown.

First antenna (pl. 29, fig. 5): Rather slender; 6-segmented, narrowing gradually distally. Proportions among segments about as follows:

$$\text{I } \frac{6.5}{6.5} \begin{pmatrix} 7 \\ 7 \end{pmatrix} \quad \text{II } \frac{10}{7} \quad \text{III } \frac{4}{4.5} \quad \text{IV } \frac{5}{5} \quad \text{V } \frac{5}{5} \quad \text{VI } \frac{2}{2} \begin{pmatrix} 2.5 \\ 2.5 \end{pmatrix}$$

Second segment with one bristle, situated distally and medially, subequal in length to fourth segment. Third segment with one antero-distal bristle, about half as long as fourth segment or somewhat more. Fourth segment with one postero-distal and two antero-distal bristles; postero-distal bristle about as long as fifth segment or total length of two distal segments; of the two antero-distal bristles, one is somewhat shorter than fifth segment, the other is about or not quite twice this length. Fifth segment with same equipment of bristles as the fourth, the shorter of the two antero-distal bristles, however, being somewhat longer. Distal segment with four bristles, three being of ordinary type and one sensory and narrowly claviform. Sensory bristle apparently not attached at base to its neighbor, and about twice longer than distal segment; the posterior one about twice the length of the sensory, the remaining ones of intermediate lengths. All bristles, except the sensory, are well pointed, non-annulated (that of second segment may have slight annulation), naked or almost so, weak, the shorter of the antero-distal ones of fourth and fifth segments being somewhat, though rather slightly, stronger than their neighbors. Pilosity: Along proximal half of anterior side of second segment and antero-distally on this segment a number of moderately long to fairly short hairs.

Second antenna (pl. 29, fig. 6): Relatively powerful and with proportions among segments quite similar to condition in *Cythereis* but protopodite is slightly larger and second endopodite segment slightly longer, relatively. Exopodite about as long as anterior side of endopodite, its first segment about three to four times longer than the second. Endopodite: First segment with one postero-distal bristle, about as long as anterior side of segment, with short hairs but without distinct annulation. The two bristles on anterior side of second segment situated well proximally to middle of segment; one of them about

as long as bristle of first segment, the other about half as long or less; both naked. Just opposite these two bristles, or slightly distal to them, there are three bristles on posterior side of segment; one of them agrees with bristle of first segment of endopodite; one is of same type but is slightly shorter; the last of the three is often situated somewhat away from the others, narrowly claviform, and about one-half as long as its longer neighbor. Posteriorly, near distal end of this segment, there are two bristles, about as in *Cythereis*; one of these is strong, gently curved near tip, its length subequal to proximal width of segment, naked or nearly so; the other is very weak and about half as long as its neighbor or somewhat more. Distal segment with two claws, evenly and moderately curved, the distal one about as long as the strong postero-distal bristle of preceding segment, naked or almost so; the other somewhat shorter and weaker, strongly pectinate. The end claws of the specimens examined were held in the position shown in appended plate 29, figure 6. Posteriorly and at base of posterior end claw, there is an exceedingly minute spine, the vestige of a third end claw. Pilosity: Proximally, on ventral side of protopodite, a few short hairs occur. About at middle of lateral side of first segment of endopodite, there is a longitudinal chitinous thickening, furnished with moderately long, stiff hairs. On anterior side of this segment, both proximally and distally, a few hairs are to be found. On second segment of endopodite, a few short hairs occur on anterior side, near proximal end of segment; and such hairs occur also along postero-distal portion of this segment.

Mandible (pl. 29, fig. 7): Masticatory segment wedge-shaped; in the specimens examined by the writer almost constantly of the type shown in the appended figure; in other words, rather long, broadest at level of attachment of palp, upper half narrowing fairly evenly dorsally, ventral half with decided constriction just below palp. Toothed edge of pars incisiva with seven teeth, the anterior (antero-lateral) of which is fairly large and powerful; the others decrease rather regularly in size and strength the more posteriorly they are situated, except the second which is distinctly smaller than the third. Anterior (first) tooth bifurcated, one of its points being distinctly shorter than the other; with two low, broad protuberances at base of inner side. Next four teeth obliquely truncated, the slanting edge armed with three more or less developed, usually rounded points. The two posterior teeth bifurcated, their points more or less sharp. Between teeth numbers 1 and 2, there is one weak bristle, often slightly longer than tooth number 2, and one short, fine spine, about half as long as its neighbor. A short, fine spine is also found between teeth numbers 2 and 3, 3 and 4, and 4 and 5. Behind toothed edge, there is a fine bristle about as long as first tooth. On anterior edge of pars incisiva, just below palp, there is a moderately large but weak bristle with short hairs, its length subequal to proximal width of pars incisiva. Palp of moderate strength, about half as long as masticatory segment is high; its proximal height subequal to width of toothed edge; becomes fairly evenly narrower distally; end segment about as long as

high ; quite distinctly 4-segmented ; lengths of segments of following proportions :

$$\text{I} \quad \frac{16}{12}$$

$$\text{II} \quad \frac{13}{10}$$

$$\text{III} \quad \frac{13}{9}$$

$$\text{IV} \quad 5$$

Epipodite situated fairly far back on lateral side of second protopodite segment ; rather short, with three or four bristles, of proportions shown in appended figure (number of bristles difficult to ascertain since these structures are weak and often more or less tangled) ; bristles appear to have scarce, long, soft hairs. Second segment of protopodite has, near distal end, a medial bristle subequal in length to two distal segments. *Endopodite*: First segment with one dorso-distal bristle subequal in length to endopodite ; ventro-distally this segment has two bristles, one of which is subequal to dorso-distal bristle or somewhat less, the other shorter, sometimes even but half as long as its neighbor. Slightly dorsal to these two bristles, on medial side, there are two bristles somewhat longer or shorter than second segment of endopodite. Second segment with a group of four bristles, somewhat distal to middle of dorsal side ; longest of these bristles subequal in length to endopodite ; the shortest about half as long or somewhat more. Ventro-distally, this segment has two bristles, above which occurs a single bristle on medial side ; this bristle and one of the two ventral ones are about as long as, or somewhat longer or shorter than the two distal segments ; the remaining of the two ventral is about half as long. All bristles of palp so far noted are of medium strength or fairly weak, non-annulated, naked or almost so. Distal segment with four distal bristles ; the two dorsal are rather strong, evenly curved claws, subequal in length to two distal segments, or one of them is somewhat shorter ; the two ventral bristles are somewhat shorter and quite weak ; all naked or almost so, and non-annulated. The limb seems to lack pilosity.

Maxilla (pl. 30, fig. 11) : Epipodial appendage with 16-17 marginal bristles, 16 being present when the short and weak dorsal one is not developed ; "aberrant bristle" of moderate length and naked. Palp and endites rather long and narrow ; palp the longest, endites decreasing in length the more proximally they are attached, as shown in appended figure. Each of endites with seven bristles of moderate lengths, those on first endite on an average somewhat shorter than those of second and third endites. Lengths, strengths, and positions of bristles about as in appended figure ; thus it is noted that one bristle on each endite is distinctly stronger than the others, viz., the next to the ventral one on first endite and the ventral one on the remaining endites. Most of these bristles seem to be naked, but some of them are furnished with fine, nearly invisible hairs. (Number of bristles apparently constant ; however, it is sometimes very difficult to establish.) Palp without distinct joints. Dorsally, at about two-thirds the length from the proximal end, there is a group of four bristles ; bristles either subequal, about half as long as dorsal side of palp or somewhat more ; or they are somewhat different in length, about as in the appended figure ; bristles of

moderate strength and naked or furnished with very short hairs. Ventrally, a short distance from tip of palp, two bristles occur; and there are three distal bristles; the ventral of the last three is a powerful, evenly curved claw, pectinated distally; the others of moderate strength or rather weak, naked or one to two of them furnished with short hairs; lengths of last five bristles about as in appended figure.

Fifth limb (pl. 30, fig. 14): Length of protopodite subequal to total length of first and second segments of exopodite; second segment of exopodite about half as long as the first; and the third somewhat longer than the second. Protopodite has at about middle of anterior side a bristle about half as long as this side or slightly more; naked or almost so. At knee, there are two bristles either subequal or somewhat different in length, the longer being about as long as anterior side of protopodite, both naked or furnished with short, exceedingly fine hairs. At about proximal one-third of posterior side of protopodite there is one bristle, about as long as or slightly shorter than segment, and furnished with short, fine hairs. All these bristles of moderate strength and non-annulated. Bristle of first segment of exopodite fairly strong, about as long as second exopodite segment, and with short, fine hairs. End claw rather powerful, about half as long as distal segment, nearly rectangularly bent just beyond middle, naked. Latero-distally the segments of exopodite have fine pectination; ventrally on first segment of exopodite there are very minute hairs, and such may be found also on the next two segments. No complex chitinous thickenings, such as are found in *Cythereis*, in distal end of protopodite. Same true in regard to next two limbs.

Sixth limb (pl. 30, fig. 15): Differs from fifth mainly in the following respects: Somewhat larger. First segment of exopodite somewhat longer relatively, being nearly equal in length to protopodite. Protopodite with only one bristle at knee; its bristle near middle of anterior side perhaps somewhat longer. Bristle of first segment of exopodite slightly weaker, and end claw perhaps slightly less hooked.

Seventh limb (pl. 30, fig. 16): Differs from sixth mainly in the following respects: Somewhat larger. First segment of exopodite slightly longer relatively, fully as long as protopodite. Posterior bristle of protopodite somewhat shorter, relatively. Bristle of first segment of exopodite distinctly weaker, almost or perfectly naked. End claw fairly gently curved.

Chitinous support of last three limbs, at sides of body, about as in the appended plate 30, figure 12; somewhat variable.

Brush-shaped organ (pl. 30, fig. 13): Two to three times longer than wide, fairly suddenly constricted near distal end; bent outward in a characteristic manner. Bristles somewhat more than half as long as organ, of unknown number.

Penis (pl. 30, fig. 9): Of type represented in appended figure. Stippled area in this figure, around tip of ejaculatory duct, represents a mass of brownish-reddish, granular matter which was present in all specimens examined. Copu-

latory appendages of the two penes practically of similar shape, as represented in figure.

Furca: Located just behind penes; with three bristles of moderate lengths and naked or with short, fine hairs.

End of body, at place where the two penes meet (pl. 30, fig. 9), represented by a small, hairy or naked verruca, furnished with a terminal bristle, with short hairs or naked.

FEMALE: Differs from male chiefly in the following respects:

Shell: Length, 0.54-0.60 mm.

Second antenna (pl. 29, fig. 8): Proximal claw of end segment of about same shape and size as the distal; both claws furnished with oblique row of very fine, weak spines.

Genital verruca rounded (pl. 30, fig. 10). Furca with two naked or nearly naked bristles. Posterior end of body irregularly cone-shaped, with a distal bristle and a varying number of stiff, moderately long hairs, some of which are arranged in a transverse row at base of distal bristle, and some in two bunches, one on either side of body, somewhat more proximally.

Remark: Because of the more or less incomplete nature of the hitherto published descriptions of the species of this genus, I have refrained from attempting to differentiate between generic and specific characters in the above description. Many of the features presented undoubtedly are of generic nature.

Type Locality: Pacific Grove, Monterey Bay, California, in rocky tide pool full of brown algae, just outside the Hopkins Marine Station on holdfasts of algae. November 23, 1920: 4 males and 3 females.

The species is named for Mr. Timothy Hopkins, the benefactor of the mentioned marine laboratory of Stanford University.

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Cytheroma similis Skogsberg, new species

PLATE 27

1. Left shell. ♂.
2. Left first antenna. ♂. x365.
3. Left mandible. ♂. x575.
4. Right second antenna. ♂. x365.
5. Masticatory process of male mandible. x535.



Cytheroma similis Skogsberg, new species

PLATE 28

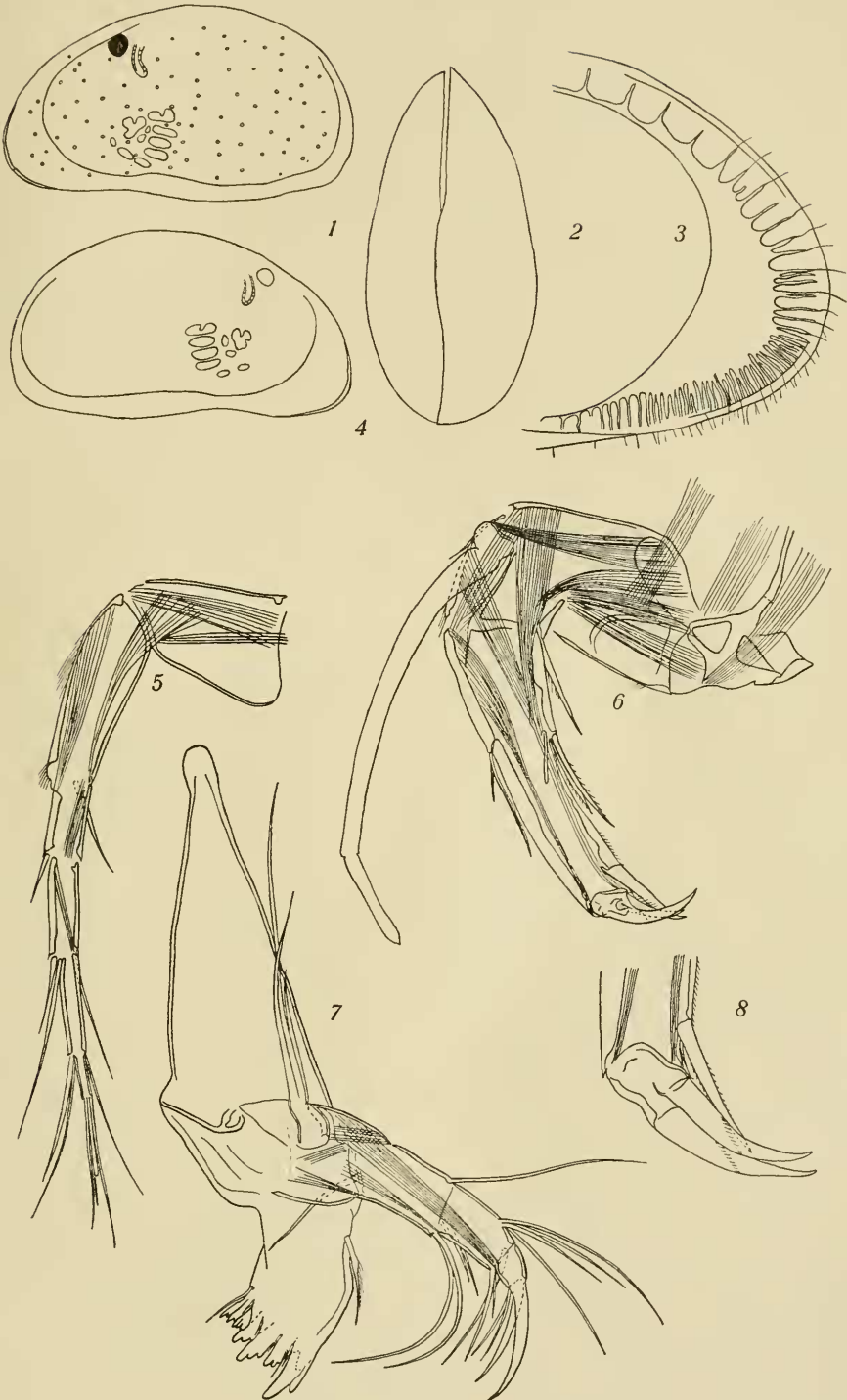
6. Left fifth leg, from inner side. ♂. x200.
7. Chitinous skeleton on sides of female body. x225.
8. Left sixth leg, from inner side. ♂. x200.
9. Left seventh leg, from inner side. ♂. x200.
10. Upper and lower lips, seen from side. ♂. x265.
11. Hind part of female body, with genital verruca. x340.
12. Brush-shaped organ. x460.
13. Penis, optic section, from outside. x200.



Xestoleberis hopkinsi Skogsberg, new species

PLATE 29

1. Shell, left. ♂.
2. Shell, from dorsal side. ♂.
3. Front portion of left shell, seen from inside. ♂. x180.
4. Shell, right. ♂.
5. Left first antenna, seen from outside. ♂. x345.
6. Left second antenna, seen from outside. ♂. x345.
7. Right mandible. Ventral portion slightly pressed under cover slip, seen obliquely from outside which makes it appear somewhat narrow. ♂. x460.
8. Tip of female second antenna, seen from outside. x500.



Xestoleberis hopkinsi Skogsberg, new species

PLATE 30

9. Left penis, from outside. x265.
10. Female abdomen and furca. x265.
11. Male maxilla, slightly compressed. x500.
12. Chitinous skeleton of thoracic sides. ♂. x265.
13. Brush-shaped organ. x345.
14. Left fifth leg. ♂. x345.
15. Left sixth leg. ♂. x345.
16. Left seventh leg. ♂. x345.

